REMARKS

Claims 1 and 5-16 were pending in the application. As noted in a Response to Election Requirement dated December 4, 2003, Applicant has withdrawn claims 2-4 and 17-30. However, Applicant reserves the right to pursue allowance of these claims should a generic claim be allowed. The Office Action rejected claims 1 and 5-16 as being indefinite. The Office Action also rejected claims 1 and 5-13 as being anticipated by the cited reference and claims 14-16 as being obvious in view of a combination of references. By this response, Applicant has cancelled claim 13, amended claims 1 and 5-12, and added new claims 31-42. Reconsideration and allowance for the above-identified application are now respectfully requested in view of the following remarks.

A. Amendment to Claims

By this response, Applicant has cancelled claim 13. Applicant has also amended claims 1 and 5-12 to clarify the invention as recited therein. Applicant has also added new claims 31-42 and submits that the matter contained therein is based in the original specification and drawings as filed. Applicant respectfully submits that the claims to the amendment do not add new matter and entry thereof is respectfully requested.

B. Information Disclosure Statement

Page 2 of the Office Action requested that the Applicant resubmit Form PTO-1449 in an Information Disclosure Statement (IDS) filed July 5, 2002 because it was found missing. Accordingly, Applicants submit herewith a courtesy copy of Form PTO-1449 mailed July 5, 2002. Because Applicants previously submitted the Form PTO 1449 in good faith, no additional

fee should be required at this time. Applicant respectfully requests that the Examiner acknowledge receipt and consideration of the references by initialing and returning a copy of the Form PTO-1449. The Examiner is respectfully requested to contact the applicant if any other submissions are required.

C. Rejections under § 112, second paragraph

Page 2 of the Office Action rejected claims 1 and 5-16 under 35 U.S.C. § 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Specifically, the Office Action rejected claim 1 as failing to support a structure of an optical logic gate and the semiconductor laser with a ballast output. Claim 1 has been amended to operably couple the first digital input with the amplifier input of the LSOA, to operably couple the digital output with the ballast laser output of the LSOA, and to further include structure of the semiconductor laser with ballast output. Accordingly, Applicants respectfully submit that the rejection of claim 1 under 35 U.S.C. § 112 has been overcome and should be withdrawn.

The Office Action rejected claims 5, 8, and 11 for failing to provide the structure of an optical NOT gate. Applicant notes that only claim 5 was directed to an optical NOT gate with claim 8 being directed to an optical NOR gate and claim 11 being directed to an optical NAND gate. However, as amended herein, claims 5 which is directed to an optical NOT gate now recites additional structure for an optical NOT gate. Claim 8, which is directed to an optical NOR gate now recites additional structure for an optical NOR gate. Finally, claim 11, which is directed to an optical NAND gate now recites additional structure for an optical NAND gate. As

such, Applicant respectfully requests that the indefiniteness rejection with respect to claim 5, 8 and 11 be withdrawn.

The Office Action rejected claims 6-7 and 9-10 because "whereby" does not define any structure and cannot serve to distinguish. Applicants have amended claims 6-7 and 9-10, thus removing the term "whereby." Applicant respectfully submits that claims 6-7 and 9-10 are no longer indefinite and thus respectfully requests that the indefinites rejection with respect to claims 6-7 and 9-10 be withdrawn.

The Office Action rejected claim 12 for reciting "a ballast laser from the ballast laser output" because it is not clear which ballast laser output from two recited LSOAs it is referring to. By this response, Applicant has deleted such language. Accordingly, Applicants respectfully submits that claim 12 is no longer rendered indefinite and requests that the indefiniteness rejection in this basis with respect to claim 12 be withdrawn.

Finally, the Office Action rejected claims 12 and 13 for failing to further narrow the limitation by reciting the end result instead of providing more specific structure. As noted above, claim 13 has been cancelled, and thus the indefiniteness rejection with respect to claim 13 is rendered moot. With respect to claim 12, Applicant respectfully disagrees. Claim 12 further narrows the claim 32, from which it depends, by characterizing the first or second optical digital input signals and the combined optical digital output signal in terms of binary format. Applicant respectfully submits that binary format is "structure" in that it is used by digital devices on which to base subsequent logic decisions. For example, an electrical digital integrated circuit can be integrated with the optical logic devices of the present invention, but the optical logic devices are most useful when the results of the optical logic devices are reduced to binary format in order to be compatible or to be able to speak to the electrical digital integrated circuit. As such,

Applicant respectfully submits that claim 12 narrows the invention as recited therein and requests that the indefiniteness rejection with respect to claim 12 on this basis be withdrawn.

D. Rejections under 35 U.S.C. 102

The Office Action rejected claims 1 and 5-13 under 35 U.S.C. § 102(e) as being anticipated by U.S. Pub. No. US 2002/0001112 to Song ("*Song*"). The Examiner cited Figure 6 of the Song patent as containing each limitation of claim 1 and inherently including a ballast output. Applicant respectfully disagrees.

Figure 6 of the Song reference is described as follows:

> Referring to FIG. 6, an O-NOT gate 40 operates on light signals based on a transfer function given in Table 1.4. This gate is implemented in any of a variety of different ways. The O-NOT gate shown is formed with a single SOA 40. **A continuous signal is provided at first input port 41. When an optical signal having sufficient intensity is presented at a second input port 42 of the SOA 40 then light from the input port 41 is substantially attenuated prior to exiting at the output port 43. When there is no signal of sufficient intensity at the second input port 42 then the optical signal entering the SOA from the first input port 41 exits the SOA at the output port 43 with minimal attenuation**.

Song reference, para. 36 (emphasis added). Thus, the Song reference describes an SOA having an amplifier input to which the first optical signal 41 is connected and an amplifier output to which the output port 43 is connected. In addition, the second input signal 42 enters through another port in the SOA and drives the binary results by affecting the first input signal 41 in some manner (e.g., by attenuation). For example, as described above with reference to Figure 6 of the Song reference, the binary nature of the output signal 43 is determined by the extent of attenuation of the input signal 41.

In contrast, independent claim 1 recites "a first lasing semiconductor optical amplifier (LSOA) having an amplifier input, an amplifier output, a pump, and a first ballast laser output,

the amplifier input of the first LSOA operably coupled to the first digital input, and the first ballast laser output of the first LSOA operably coupled to the digital output." The present invention operates using a completely different mechanism than the Song reference. The present invention uses an LSOA to perform optical logic functions. An LSOA is distinguishable from an SOA in that it is fast in comparison to other semiconductor-based optical implementations. This increased speed is due to the high intensity field (laser or injected) that is present in an LSOA. See Applicant's Specification, para. 37.

Unlike an SOA, an LSOA can comprise the byproduct of a ballast laser during amplification of an optical signal. The LSOA operates on the principle that amplification of an input optical signal may or may not produce a ballast laser output depending on the intensity of the input optical signal. That is, the ballast laser output increases as the amplifier input level decreases, and the ballast laser output decreases as the amplifier input level increases. See Applicant's specification, para. 62. Claim 1 thus requires that a "**ballast laser output of the first LSOA [be] operably coupled to the digital output**." Thus, instead of measuring the amount of attenuation of the first optical digital input signal to determine the digital output as the Song reference does, the present invention evaluates the ballast laser output to determine the digital output. As such, the digital output is produced by a completely different mechanism than in the Song reference. In fact, as will be argued below, the Song reference would not be able to produce a digital output in the same manner as the present invention.

The Song reference cannot be interpreted to construe the output port 43 as a ballast laser output as is evident by its description of how the SOA operates. As discussed above, the Song reference only teaches an SOA having an amplifier input 41 and an amplifier output 43 with an ancillary input port 42 which drives the digital result. The Applicant has diligently searched the

Song reference and finds no teaching or suggestion that the output port 43 could possibly be a ballast output.

The Applicants also respectfully disagree with the Examiner's assertion that an SOA inherently includes a ballast laser output. A ballast laser output is a feature that stabilizes the semiconductor gain of an LSOA so that the semiconductor gain remains constant during changes in power level. The Song reference does not teach a ballast laser output, or, for that matter, any other ballast output for stabilizing the semiconductor gain level of the SOA taught therein. Even assuming, *arguendo*, that a ballast output were inherent in the SOA of the Song reference, there are many different ways for creating a ballast output, only one of which is a ballast laser output. "[A]nticipation by inherent disclosure is appropriate only when the reference discloses prior art that **must necessarily** include the unstated limitation." Transclean Corp. v. Bridgewood Services, Inc., 290 F.3d 1364, 1373, 62 USPQ 2d 1865 (Fed. Cir. 2002). The courts have held that an argument for anticipation cannot be based on mere probabilities or possibilities. Thus, simply because it is *possible* for the SOA of the Song reference to include a ballast laser output, this is not sufficient to inherently anticipate the limitations of claim 1.

In view of the foregoing, Applicant respectfully requests that the anticipation rejection with respect to claim 1 be withdrawn.

Claims 5-13 depend from claim 1 and thus incorporate the limitations thereof. As such, Applicant respectfully submits that claims 5-13 are distinguishable over the Song reference for at least the same reasons as discussed with respect to claim 1. Applicant therefore requests that the anticipation rejection with respect to claim 5-13 be withdrawn.

E. Obviousness Rejections

Page 5 of the Office Action rejected claims 14-16 over the Song reference in view of U.S. Patent No. 6,347,104 to Dijaili et al. The Office Action asserted that the Dijaili reference teaches a LSOA of the present invention and that the LSOA can be a vertical LSOA, a traverse LSOA, or a longitudinal LSOA. However, Applicant respectfully submits that even if the Song reference were modified as suggested by the examiner, there is no teaching or suggestion in the combination of the Song reference and the Dajaili reference to have "the amplifier input of the first LSOA operably coupled to the first digital input, and the ballast laser output of the first LSOA operably coupled to the first digital output" as recited in claim 1. As such, Applicant respectfully requests that the obviousness rejection with respect to claims 14-16 be withdrawn.

F. New Claims

Applicant respectfully submits that new claims 31 and 32 are distinguishable over the Song reference and/or Dijaili reference for at least the same reasons discussed above with respect to claim 1.

In addition, Applicant respectfully submits that new method claims 33-42 are distinguishable over the Song reference and/or Dijaili reference as they do not teach or suggest "operably coupling the digital output to a ballast laser output of the first LSOA" as recited in independent claim 33.

Applicant therefore respectfully submits that new claims 31-42 are in condition for allowance.

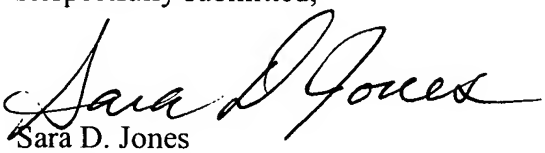
No other rejection or objections were raised in the Office Action.

G. Conclusion

In the event that the Examiner finds remaining impediment to a prompt allowance of this application that may be clarified through a telephone interview, the Examiner is requested to contact the undersigned attorney.

Dated this 10th day of August, 2004.

Respectfully submitted,



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